CLAIMS

1. A device for winding, at high speed, a yarn onto a rotating support and comprising a yarn delivery system (5, 6), displaced so as to undergo a to-and-fro movement parallel to the surface of said support with rapid deceleration and acceleration at the point of reversal of the to-and-fro movement, the depositing yarn guide (6) being displaced by means of a moving element or cursor (5) associated with a magnetized plate (1) of a linear motor, supplied with two-phase or three-phase current, **characterized in that** the stator of the linear motor is formed by at least one assembly of elementary modules placed either face to face or placed so that each lies in the extension of another, each having a plurality of C-shaped magnetic circuits (4) that define, between the ends of their separated legs, an airgap inside which the magnetized plate (1) is positioned, comprising an alternation of North and South poles (N and S), which constitutes the moving element that displaces the cursor (5) carrying the yarn guide (6) and in which:

· the magnetic circuits (4) of each elementary module are formed by a plurality of pairs of posts (P1, P2) placed opposite each other in each pair, each series of posts (P1) and (P2) being associated with a coil (3) in order to form a magnetic field in the airgap that they define, the spacing between two consecutive posts corresponding to twice the distance between two consecutive North/South poles (N/S) provided on the flat magnet (1);

· the posts of a module that are connected to one and the same phase of the electrical supply are offset relative to the posts that are connected to the other phase or other phases by a value corresponding to the magnetic step divided by the number of phases;

· the magnetized plate (1) has dimensions enabling it to be inserted into the airgap of at least one elementary module of each of the supply phases,

especially a length in order to cover two aligned modules (with a two-phase supply) or three aligned modules (with a three-phase supply), or especially a width in order to cover two modules (with a two-phase supply) that are placed facing each other, said plate comprising, on these two phases, an alternation of North/South poles (N/S) spaced apart by a distance corresponding to at least the half-distance lying between two consecutive posts; and

· means are provided for keeping the magnetized plate (1) strictly in the mid-plane of the airgap of the magnetic circuit.

2. The device as claimed in claim 1, in which the electrical supply is a two-phase current supply, characterized in that it comprises at least three aligned elementary modules (2a, 2b, 2a), the posts (P1b, P2b) of the central module (2b) being offset by one half of the magnetic step, on the same side, relative to the posts (P1a, P2a) of the preceding module (2a) and of the following module (2a) which is associated therewith.

3. The device as claimed in claim 1, in which the electrical supply is a three-phase current supply, characterized in that it comprises at least four aligned elementary modules (2a, 2b, 2a, 2b), the posts of the second module being offset by one third of the magnetic step and on the same side relative to the posts of the preceding module, and the posts of the third module being offset by one third of the magnetic step relative to the posts of the second module.

4. The device as claimed in one of claims 1 to 3, characterized in that it comprises two stators consisting of aligned elementary modules, said stators being mounted symmetrically on either side of a central plane of symmetry, the magnetized plate (1), which constitutes the moving element that displaces the yarn

guide (6), having, placed symmetrically with respect to its longitudinal axis, on both its faces and in the region located in the airgap of the posts, an alternation of North and South poles that are placed in correspondence, the yarn guide element being mounted on a cursor (5) fixed to a central reinforcement (12) lying in the mid-plane of said magnetized plate between the two series of magnetic poles.

5. The device as claimed in claim 1, characterized in that the electrical supply is a two-phase current supply, characterized in that it comprises at least one pair of two modules (2a, 2b) facing each other, connected to each of the two phases respectively, the posts of one of the modules being offset by one half of the magnetic step relative to the posts of the module that faces it.

6. The device as claimed in any one of claims 1, 2 and 5, characterized in that it comprises a plurality of pairs of opposed modules making it possible to obtain any travel:

- the modules connected to one phase being placed in such a way that their posts are spaced apart by an integral number of pairs of magnetic steps so that, whatever the position of the magnet, their posts are facing a pole of the same sign; and
- the modules connected to the other phase are placed in such a way that their posts are spaced apart by an integral number of pairs of magnetic steps, and therefore in such a way that, whatever the position of the magnet, their posts are facing a pole of the same sign, and in such a way that they are all offset by one half of the magnetic step and in the same direction relative to the posts of the modules connected to the first phase.

7. The device as claimed in claim 5 or 6, characterized in that all the modules connected to any one phase are aligned on the same side of the magnet.

8. The device as claimed in claim 5 or 6, characterized in that it comprises an alternation of modules in such a way that, on each side of the magnet, the aligned modules are connected to the two phases alternately, each having, facing it, a module connected to the opposite phase.

9. The device as claimed in claims 1 and 5, characterized in that all the modules may be placed so as to face one another and in alignment without any offset, the magnetized plate then having, on either side of its axis of symmetry, an alternation of North/South poles offset by one half of the magnetic step, and in this case all the modules located on one and the same side of the magnet are connected to the same phase.

10. The device as claimed in one of claims 1 to 9, characterized in that the C-shaped magnetic circuits (4) of each linear module are produced in a one-piece assembly by machining or molding hollowed-out notches in order to define consecutive posts placed in pairs opposite each other and defining an airgap between them.

11. The device as claimed in one of claims 1 to 9, characterized in that the C-shaped magnetic circuits (4) of each elementary module are formed by a succession of C-shaped plates separated from one another.

12. The device as claimed in one of claims 1 to 11, characterized in that the elementary modules (2a, 2b) (or 2a, 2b, 2c) are identical, the offset by one half of the magnetic step or by one third of the magnetic

step of the posts of one module relative to the posts of the preceding module that faces it being obtained by the mutual spacing of the elementary modules.

13. The device as claimed in one of claims 1 to 12, characterized in that it includes means for guiding the cursor carrying the yarn guide, which means keep the magnetized plate in position in the airgap of the stators and opposing the attractive forces between the magnets and the poles of the magnetic circuit.

14. The device as claimed in claim 13, characterized in that the guiding means are formed by sets of rollers placed on the cursor (5), which rollers run along guides (11) that extend over the entire length of the delivery system.

15. The device as claimed in one of claims 1 to 14, characterized in that the reversal of the to-and-fro direction of the yarn guide (6) is commanded and controlled by means for detecting the position of the cursor supporting the yarn guide.

16. The device as claimed in claim 15, characterized in that the means for detecting the position of the cursor are formed by one or more sensors based on a fixed Hall-effect probe (18) which are placed near the passage for the flat magnet (1) constituting the moving element that displaces the yarn guide, this probe (18) delivering a signal proportional to the magnetic field.

17. The device as claimed in claim 16, characterized in that the signal delivered by the probe (18) is processed so as to detect the arrival of the magnet (1) by the appearance of a first front and then its displacement, by counting alternations resulting from the running of the North and South poles of said magnet.

18. The devices as claimed in one of claims 1 to 16, comprising a large number of modules in order to provide a long travel, characterized in that only the modules that are placed facing the magnetized plate (1) are supplied, the other elements or modules being disconnected throughout the time when the magnet is outside of their range, thus allowing them to cool down.